

## CLAIMS

1. A method of decontaminating a gas intended for use in photolithography  
2 and metrology to remove from the gas or reduce the concentration in the gas of  
a contaminant which interferes with light transmittance, which comprises  
4 removing said contaminant from the gas by passing the gas through a body of  
decontaminant comprising 10 to 80 percent by volume of an electropositive  
6 metal component; 10 to 80 percent by volume of a high silica zeolite; and 10 to  
80 percent by volume of a late transition metal compound, wherein each  
8 component comprises at least 10 percent by volume of said composition and the  
total of the components equals 100 percent by volume.
2. A method as in Claim 1 wherein the body of the decontaminant  
2 comprises a mixture of an electropositive metal component, a high silica zeolite,  
and a late transition metal compound in a ratio on or within the area bounded by  
4 the line A-B-C in Figure 2.
3. A method as in Claim 1 further comprising removal of the contaminant  
2 prior to or after treatment of the gas to remove solid particulate matter from the  
gas.
4. A method as in Claim 1 wherein the contaminant is gaseous.
5. A method as in Claim 4 wherein the contaminant comprises a neutral  
2 polar gaseous molecule.
6. A method as in Claim 4 wherein the contaminant comprises a neutral  
2 polar aprotic molecule.

- 2     7.     A method as in Claim 4 wherein the contaminant comprises a protic or  
aprotic alkaline molecule.
- 2     8.     A method as in Claim 4 wherein the contaminant comprises an acidic  
polar species.
- 2     9.     A method as in Claim 4 wherein the contaminant comprises an  
environmental gas.
- 2     10.    A method as in Claim 1 wherein the contaminant comprises at least one  
of gaseous or entrained water, an alcohol, a nitrogen oxide, a sulfur oxide, an  
organic sulfide, an organic halide, an amine, a hydrocarbon, a siloxane, a  
4     carbon oxide or an environmental gas.
- 2     11.    A method as in Claim 1 wherein the gas after decontamination is used in  
photolithography.
- 2     12.    A method as in Claim 1 wherein the gas after decontamination is used in  
metrology.
13.    A method as in Claim 1 wherein the concentration of the contaminant in  
the gas is reduced to not more than 1 ppb.
- 2     14.    A method as in Claim 13 wherein the concentration of the contaminant  
in the stream is reduced to not more than 100 ppt.
- 2     15.    A method as in Claim 14 wherein the concentration of the contaminant  
in the gas is reduced to not more than 1 ppt.

16. A method as in Claim 1 wherein the contaminant removed or reduced comprises a contaminant which interferes with transmittance of light having a wavelength of 248 nm.

2 17. A method as in Claim 16 wherein the concentration of the contaminant in the gas is reduced to not more than 1 ppb.

2 18. A method as in Claim 1 wherein the contaminant removed or reduced comprises a contaminant which interferes with transmittance of light having a wavelength of 193 nm.

2 19. A method as in Claim 18 wherein the concentration of the contaminant in the gas is reduced to not more than 100 ppt.

2 20. A method as in Claim 1 wherein the contaminant removed or reduced comprises a contaminant which interferes with transmittance of light having a wavelength of 157 nm.

2 21. A method as in Claim 20 wherein the concentration of the contaminant in the gas is reduced to not more than 100 ppt.

2 22. A method as in Claim 1 wherein the contaminant removed or reduced comprises a contaminant which interferes with transmittance of light having a wavelength  $\leq 100$  nm.

2 23. A method as in Claim 22 wherein the concentration of the contaminant in the gas is reduced to not more than 1 ppt.

2 24. A method as in Claim 1 further comprising a providing a generator of coherent light as a source of light for the photolithography or metrology.

25. A method as in Claim 24 wherein the generator or coherent light  
2 comprises a laser.

26. A method as in Claim 1 further comprising a providing a generator of  
2 noncoherent light as a source of light for the photolithography or metrology.

27. A composition for decontaminating a gas intended for use in  
2 photolithography and metrology by removing from the gas or reducing the  
concentration in the gas of a contaminant which interferes with light  
4 transmittance, which composition comprises:

10 to 80 percent by volume of an electropositive metal component;  
6 10 to 80 percent by volume of a high silica zeolite; and  
10 to 80 percent by volume of a late transition metal compound,  
8 wherein the total composition comprises 100 percent by volume.

28. A composition as in Claim 27 which effects a reduction in the  
2 contaminant content of said gas stream to not more than 1 ppb.

29. A composition as in Claim 28 which effects a reduction in the contaminant  
2 content of said gas stream to not more than 100 ppt.

30. A composition as in Claim 29 which effects a reduction in the contaminant  
2 content of said gas stream to not more than 1 ppt.

31. A composition as in Claim 27 wherein at least one of the electropositive  
2 metal component, the high silica zeolite and the late transition metal compound  
is in a particulate, coating, pelleted, extruded, plate or powder form, or a mixture  
4 of such forms.

2 32. A composition as in Claim 27 wherein the electropositive metal in the electropositive metal component comprises a Group 3 or 4 metal, metal salt or metal oxide.

2 33. A composition as in Claim 32 wherein said electropositive metal component comprises a Group 3 or 4 metal oxide selected from the group consisting of titania, zirconia, yttria, or vanadia.

34. A composition as in Claim 33, wherein the metal oxide comprises titania.

2 35. A composition as in Claim 32, wherein the electropositive metal component has a surface area in the range of 140-1200 m<sup>2</sup>/g.

2 36. A composition as in Claim 35 wherein the electropositive metal component has a surface area in the range of 140-500 m<sup>2</sup>/g.

2 37. A composition as in Claim 27, wherein said high silica zeolite comprises a zeolitic structure with an silica:alumina ratio of at least 90:1.

2 38. A composition as in Claim 37 wherein said high silica zeolite comprises a zeolitic structure and a silica:alumina ratio of at least 300:1.

2 39. A composition as in Claim 38 wherein said high silica zeolite comprises a zeolitic structure and a silica:alumina ratio of at least 400:1.

2 40. A composition as in Claim 39 wherein said high silica zeolite comprises a zeolitic structure and a silica:alumina ratio in the range of 400-2000:1.

2 41. A composition as in Claim 27 wherein said high silica zeolite comprises Zeolite Y or zeolite ZSM-5.